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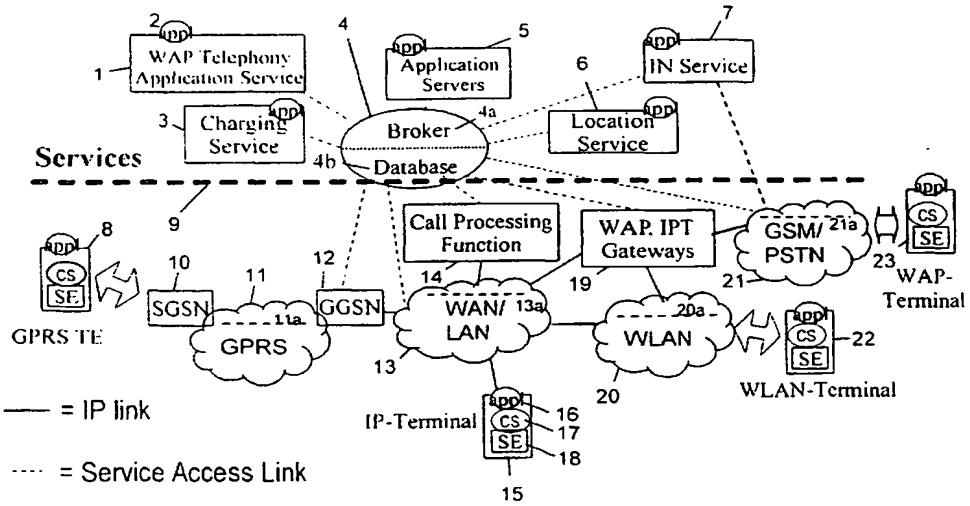
(54) Title: SYSTEM AND METHOD FOR THE PROVISION OF SERVICES OVER DIFFERENT NETWORKS



(57) Abstract: The invention provides a communication system comprising at least one terminal network element which can be connected to other network element(s) located in the same or another network. The system is adapted to allow an activation of at least one service, e.g. location service, for the at least one terminal network element, the service being executable based on service logic. The terminal network element(s) comprises or implements a standardised terminal environment for executing at least part of the service logic. Further, a standardised network application programming interface is provided for accessing at least one of the services. A broker cooperates with or has access to the standardised network application programming interface and the services. Thus, an infrastructure is provided which enables services to roam with a user. The customers can therefore roam from one network to another network (hybrid network) and will still keep the same services across these different networks.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

TITLE OF THE INVENTION

SYSTEM AND METHOD FOR THE PROVISION OF SERVICES OVER DIFFERENT NETWORKS

FIELD OF THE INVENTION

The invention relates to a communication system and method, and in particular refers to the provision of services such as communication services over two or more different networks.

BACKGROUND OF THE INVENTION

Networks such as communication networks allowing a bidirectional communication, or data networks such as the Internet, are usually adapted to provide one or more services to the subscribers. These services are sometimes termed "communication services" and provide end user services including traditional telecommunication services like "Call Forwarding to another Destination" (such as another phone number or address), "Call Waiting", "Call Transfer", etc., and more recent services e.g. providing a messaging function such as multimedia instant messaging MMS (Multimedia Messaging Service), short message service (SMS), mail, call presentation service and all other services in that or other categories.

As a further service example, a location service (LS) may be provided which represents a function for locating a VoIP user (VoIP stands for Voice over IP-based networks such as the Internet, or more general voice information transmission over packet-based networks).

Actual services are targeted to and adapted for particular

networks. Services of the first generation such as ISDN supplementary services have at least partially been replaced by second generation solutions such as Intelligent Network (IN) based services. Networks of the third generation (3G) are likewise adapted to provide services of similar kind.

Generally, one of the requirements of actual and future networks is the possibility to enable customers to roam from one network to another network (termed „hybrid network" comprising two or more networks of different kind).

Another topic of interest is the further development of the transmission of Voice over packet based networks such as VoIP (Voice over IP-based networks, such as Internet). One of the VoIP protocols is Session Initiation Protocol (SIP).

In the following, packet-based networks the abbreviated as PBN. Such packet-based networks can be of different nature and include GSM-based networks, GPRS (General Packet Radio Service), WCDMA (Wideband Code Division Multiple Access), Blue Tooth, WLAN (Wireless LAN, Wireless Local Area Network), etc.). Actual services are limited to a specific type of network. The development of terminals enable an end user to roam between different PBN-types. The end user may e.g. be connected to a Blue Tooth system at home, a GPRS based network on the way to work, and to a WLAN at work. The user will normally be provided with different services when roaming from one network to another.

SUMMARY OF THE INVENTION

The invention provides a system and method which enable a user to be provided with one or more services which are maintained even when roaming to different networks. The services operate

over hybrid network and follow a user when roaming. Hence, the users will be provided with activated services even across network boundaries, and do experience the advantage of always being provided with a selected service even when roaming to another network or when changing the terminal network element which may be a terminal equipment such as a mobile phone, a computer station such as a laptop, etc. The services are able to cooperate, if necessary, with existing services such as telecommunication services provided by intelligent networks so as to insure to continuity of the offered service or services.

In accordance with an aspect of the invention, a communication system is provided which comprises at least one terminal network element which can be connected to other network element(s) located in the same or another network. The system is adapted to allow an activation of at least one service for the at least one terminal network element, the service being executable based on service logic. The terminal network elements or at least one thereof, comprises or implements a standardised terminal environment for executing at least part of the service logic. One or more standardised network application programming interfaces are provided for accessing at least one of the services.

The communication system preferably comprises a broker such as an object request broker cooperating with, or having access to, the standardised network application programming interface and the services. The standardised network application programming interface is preferably provided in the network(s), or between service providing elements and the network(s). The broker may also be implemented by using SOAP (Simple Object Access Protocol) and an advanced DNS (Domain Name Service) such as Microsoft DEN.

One or more of the terminal network elements preferably are

mobile network elements, IP terminal(s), WAP terminal (s) and/or WLAN terminal(s).

In a preferred embodiment, the standardised terminal environment is a MExE or similar environment.

The network(s) preferably is/are packet-based network, e.g. a GPRS, UMTS, WAN, LAN, WLAN, GSM, WCDMA, and/or TDMA network.

The services may include a charging service, a location service, an IN (Intelligent Network) service, a WAP telephony application service, Discovery Service, Presence, Instant Messaging, and/or VoIP through SIP servers.

The invention furthermore provides a method to be performed in a communication system, as defined in the method claims.

Thus, in accordance with an aspect of an implementation of the invention, an infrastructure is provided which enables services to roam with a user and furthermore to access existing telecommunication services.

The customers can therefore roam from one network to another network (hybrid network) and will still keep the same services across these different networks.

The invention allows services to be offered across hybrid networks.

In accordance with preferred embodiments of the invention, one or more of the following features are provided:

running the service logic on the terminal network element(s) such as end user terminals;

providing a standard terminal environment to run the service or services;

providing a standard network interface so as to abstract the different networks behind this standard network interface;

accessing existing services over a broker means such as a standard object request broker (ORB).

Further aspects, details and advantages of the invention will be described in the following with reference to a preferred embodiment shown in the drawing.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 shows the basic structure of an embodiment of a system according to the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION.

Fig. 1 shows an embodiment of a system in accordance with the present invention. This embodiment may be implemented so as to be provided in any type of network, in particular a packet based network (PBN). A PBN is any medium, e.g. any shared, switched or point-to-point medium, which provides peer-to-peer connections or communications between two or more end points using a packet based transport protocol. PBN includes mobile networks using packet based technology.

Below, some abbreviations will be used which have the following meaning. „GSM" stands for „Global System for Mobile Communication". „PSTN" means „Public Switched Telecommunication Network". A "SGSN" is a serving GPRS support node. A "GGSN" is a gateway GPRS support node. „SE" stands for „Standard Environment" such as or comparable to the GPRS standard MExE as defined by ETSI (European Telecommunications

Standards Institute). „WAP" stands for „Wireless Application Protocol" standardised by the WAP-forum. "UMTS" means Universal Mobile Telecommunication System. WCDMA stands for Wideband CDMA (Code Division Multiple Access). A "broker" may for instance be any object request broker and means any standard mechanism to communicate between applications. The broker may have or be equivalent to a Corba (Common object request broker architecture) structure. A „service" may consist of an application or applet and its related content and may be defined to be a function or set of functions offered to a user by a service provider, network operator or any other organisation. The service may be performed e.g. on a mobile station implementing MExE or Web Security (i.e. Sandbox), etc.).

Fig. 1 illustrates an example of a system in accordance with the invention. This embodiment is implemented in a hybrid network, e.g. a network structure including several networks of different types such as a GPRS network 11, a WAN/LAN (Wide Area Network / Local Area Network) 13, a WLAN (Wireless Local Area Network) 17, and a GSM/PSTN network 18. According to one aspect of this embodiment, the users can roam between these different network types. For instance, a user can roam from the GPRS-based network 11 to the WLAN 17 or to network 18 (which may also be a WAP-based network) e.g. when travelling or commuting. The user may also connect, e.g. at work, to the WAN or LAN 13. When roaming between these networks of different types, the user may always use the same user equipment, provided same is adapted to connect to the different networks. The user may alternatively or additionally use different terminal equipments (terminal network elements), e.g. depending on his/her actual location such as being at home, at work, visiting a customer, travelling or the like. For instance, one and the same user may have access to, and use, a terminal equipment (TE) 8 adapted for GPRS network

(GPRS TE), a terminal equipment (IP-Terminal) 15 which may be adapted for communication using the Internet protocol (IP), a terminal equipment (WLAN-Terminal) 22 adapted for a WLAN network, and/or a terminal equipment (WAP-Terminal) 23 being implemented as a WAP terminal, e.g. as a terminal adapted for communication using WAP (Wireless Application Protocol) and thus enabling a WAP-based Internet access.

At least one user terminal equipment, preferably more than one or even all terminal equipments provided for one or more users, such as the terminal equipments 8, 15, 22 and 23, may have a structure as shown in Fig. 1. As illustrated with regard to terminal equipment 15 as an example, the terminals preferably comprise a structure which includes an application part 16 which provides the necessary interface and software and/or hardware structure for communication with the respective network, a layer CS 17 which provides Communication Services (CS), and may be an Application or Service Logic, and a standard environment SE 18.

The terminal equipments (terminal network elements) 8, 22 and 23 are connected by radio access to their associated networks as illustrated by double headed arrows. The IP terminal 15 may be connected to the network 13 via an IP link or other links including radio access. In the drawing, IP links are represented by a solid lines. Service access links are represented by broken lines.

When the GPRS-based terminal equipment 8 transmits and/or receives information such as user traffic or signalling messages, it communicates with a support node 10 (SGSN) which forms part of GPRS network 11. When the connection involves one or more further networks such as networks 13, 20 or 21, the connection is routed via a gateway node 12 (GGSN).

The network 13 is equipped with, or has access to, a call processing function 14 providing the necessary functionality for properly processing and handling calls within network 13 or across boarders to other networks such as network 11, 20 or 21. Further, one or more gateways 19 are provided which may WAP gateways or IPT (IP-terminal) gateways and provide the gateway functions for connection handling to and from or within networks such as networks 13, 20 and 21.

The networks in and for which the invention may be applied are not restricted to the networks shown in Fig. 1. As an alternative, or in addition to the networks shown in Fig. 1, one or more WCDMA networks, one or more UMTS networks, and/or networks of other types may be provided.

The users (user equipment, i.e. terminal equipments) are provided with several services which may be freely selectable, such as call forwarding, or may be forcibly implemented such as the charging service. Fig. 1 shows several different types of services. According to Fig. 1, the services are shown above a broken horizontal line 9 which symbolises that, in accordance with a preferred structure of the invention, the services are not implemented within the networks inaccessible from the outside but are invoked according to need or options in such a manner that the users do not recognise any significant change, if at all, regarding the provided services and service handling even when roaming and changing the attached network and/or the used equipment (such as terminal equipments 8, 15, 22, 23). Such services can be provided by the network or by the terminal or by both the network(s) and the terminal(s).

Fig. 1 shows some examples of services. In an actual implementation of the invention, only some of the shown services may be offered. As an alternative, all the services,

additional services or other services may be provided. The invention intends to cover all these cases. According to the embodiment shown in Fig. 1, there are provided a WAP telephony application service 1 providing WAP connection for accessing an IP-based network such as the Internet, a charging service 3 for properly calculating and assigning the charges of calls connections, used services or other items. Further, one or more application servers 5 are provided which are able to perform services by running applications as provided by the network operators, service providers or requested by users. In addition, a location service 6 is implemented which is a function to locate VoIP user(s). Moreover, an Intelligent Network (IN) service 7 is provided which offers support for handling connections when e.g. decisions are to be made. For invoking desired services, application functions/programs such as applets 2 are provided for each service, as shown in Fig. 1 in elliptical shapes. Further, VoIP may be implemented by SIP and discovered with SIP mechanism.

In the embodiment shown in Fig. 1, a means 4 is provided which comprises a broker 4a and a database 4b. The broker 4a and the database 4b may be implemented in the same device having broker functionality and sufficient storage capacity for storing the database 4b. In an alternative embodiment, the broker means 4a and the database 4b are implemented in different devices which may be connected to each other via a physical hardware link or temporary access links, etc. The database 4b stores profiles for users which are allowed to roam between the different networks such as shown in Figure 1. The contents of database 4b essentially comprises two parts: a first part describes the terminal properties of the terminal equipments assigned to or accessible by certain or all users. This part may store information on all terminal equipments connectable to the networks. In this database part, information on the types, properties, specifications (e.g.

data rates) of the respective terminal equipments, the capabilities thereof and other features such as identities, e.g. SIM card entries, may be registered. Further, in a second part of database 4b, services provided or selectable for the respective users are registered. E.g., services actively activated by a user, or services forcibly provided for the users such as charging service 3, are marked, in the database, as active services. When a user roams, i.e. attaches, to another network, or starts to use another terminal equipment, the database 4b is checked by this another network or some other function, or by the network to which the newly used equipment starts the attachment process, for retrieving information on activated services. When such activated service(s) is found, this service(s) is invoked, or maintained, also for this new network and/or newly used terminal equipment.

The broker 4a may be implemented as an object request broker (ORB) which may have a CORBA structure, or as a SOAP/DEN implementation. CORBA stands for "Common Object Request Broker Architecture" such as specified by the Object Management Group (OMG). CORBA addresses interoperability in distributed heterogeneous environments, and can be conceptualized as a communication bus for client-server objects. CORBA is a three-tier distributed object mechanism so that the terminology "client-server" applies within the context of a specific request. If one of the networks 11, 13, 20, 21 invokes a service from the service devices or functions 1, 3, 5, 6 and/or 7, the network can be termed client, and the service providing device or function can be termed server. Exported server interfaces can be specified in a CORBA standard interface definition language (IDL). As such a CORBA structure is known to the skilled man, no further description details are necessary. The broker 4a can have such a CORBA structure, or can be implemented in any other suitable manner which

ensures that a requested service is appropriately invoked and provided.

The broker may also be implemented by e.g. using SOAP (Simple Object Access Protocol) and an advanced DNS (Domain Name Service) such as Microsoft DEN.

Figure 1 shows a global view of the provision of services (e.g. communication services) over a hybrid network structure. Further details of the structure and of the method of functioning and operation of the embodiment will be described below. Generally, the service or services presently activated for one or more users (e.g. subscribers to a specific network or visiting users only temporarily present in a network) will be provided over the hybrid network structure when roaming across different network. Services will either be transferred or are resident on one or more terminal equipments (network elements) used by the user(s) and access the network functionality through a standard interface in a preferably secure environment. However, the services may also at least be partly provided by the network to which a user is presently attached when e.g. the terminal resources often the terminal equipment should not be sufficient for instance for voice recognition, or when the implementation of the activated service or services is better implemented within the network, or when e.g. network legacy resources, e.g. for lawful interception or the like, have to be accessed. The combination of network-based services accessed through a standard application programming interface (API), and terminal-based services run in a standard environment (SE 18), and the cooperation of these functionalities allows the stable and reliable provision of services over hybrid networks. Any roaming user will therefore be provided with the presently activated services in a reliable manner even when roaming between networks of different types.

When services run on the end user terminal equipment such as network element 8, 15, 22 or 23, the standard environment (SE) 18 provided in and by the terminal equipments allows the services to act in a standardized way. The standard environment 18 takes care of security matters and defines a standard API (Application Programming Interface) toward the network (e.g. charging, call processing, messaging etc.). Such a standard environment 18 may be, in a GPRS environment, e.g. terminal equipment 8 and network 11, the standard environment called MExE (Mobile Station Application Execution Environment). Such a standard environment of MExE or other type is extended, i.e. implemented, in the terminal equipments 15, 22, 23 etc. attributed to the users, that is to all terminals on the packet based networks (PBN) which the user may use. This ensures that a standard and stable environment exists on all the terminals to which the user or users may have access. Therefore, services are able to flow freely between terminals of different nature because of the standard environment implemented in these terminals.

When the service or services completely or at least partially run on the network or networks like e.g. IN based legacy service or charging service, these services can be accessed through a standard API with the help of the broker 4a. The standard network API is indicated, in Figure 1, by the broken line 9 on a superordinate level. In detail, each network will implement, or have access to, such a standard network API. This standard network API is represented by a broken line within each network which standard API has an "a" attached to the reference numeral of the associated network (standard API 11a for network 11, standard API 13a for network 13, standard API 20a for network 20, and standard API 21a for network 21). This network API 11a, 13a, 20a, 21a is standardized for each network so that the broker 4a has to communicate with only one

one standard interface type independent of the network actually provided behind this standardized API. This configuration contributes to open up traditional telecommunication networks and renders available at least one, several or all network-based services in a standardized way.

In the present embodiment, the terminal services described above such as the standard environment, are combined with the standard network API 11a, 13a, 20a, 21a so as to build a strong environment for rendering available services in a reliable manner across networks and terminals.

With regard to the standard network API, a network API may be used as defined e.g. by the Parlay organization.

Instead of providing a standard network API 11a, 13a, 20a, 21a in each network, the networks as such may also remain basically unchanged in their structure, and the application programming interface 9 may provide the necessary standardized interface function. In this case, a gateway may be provided which is able to communicate with each of the network of the hybrid network structure (here: networks 11, 13, 20, 21) and which communicates with the standard application programming interface 9 so as to provide the connections between the networks and the broker 4a.

Although the invention has been described above with reference to preferred embodiments, modifications, amendments or additions are likewise included in the scope of the invention.

CLAIMS

1. Communication system comprising at least one terminal network element which can be connected to other network element(s) located in the same or another network, wherein

the system is adapted to allow an activation of at least one service for the at least one terminal network element, the service being executable based on service logic,

the terminal network element, or, in case of several terminal network elements, at least one thereof, comprises or implements a standardised terminal environment for executing at least part of the service logic, and

a standardised network application programming interface is provided for accessing at least one of the services.

2. Communication system according to claim 1, comprising a broker cooperating with, or having access to, the standardised network application programming interface and the services.

3. Communication system according to claim 2, wherein the broker is an object request broker.

4. Communication system according to any one of the preceding claims, wherein the standardised network application programming interface is provided in the network(s), or between service providing elements and the network(s).

5. Communication system according to any one of the preceding claims, wherein at least one of the terminal network elements is a mobile network element.

6. Communication system according to any one of the preceding claims, wherein at least one of the terminal network elements is an IP terminal, a WAP terminal and/or a WLAN terminal.

7. Communication system according to any one of the preceding claims, wherein the standardised terminal environment is a MExE or similar environment.

8. Communication system according to any one of the preceding claims, wherein the network(s) is/are a packet-based network.

9. Communication system according to any one of the preceding claims, wherein the network(s) is/are a GPRS, UMTS, WAN, LAN, WLAN, GSM, WCDMA, and/or TDMA network.

10. Communication system according to any one of the preceding claims, wherein the at least one service is a charging service, a location service, an IN (Intelligent Network) service, and/or a WAP telephony application service.

11. Method to be preformed in a communication system, preferably in a communication system according to any one of the preceding claims, which comprises at least one terminal network element which can be connected to other network element(s) located in the same or another network, wherein

at least one service for the at least one terminal network element can be activated and executed based on service logic,

the terminal network element, or, in case of several terminal network elements, at least one thereof, comprises or implements a standardised terminal environment for executing at least part of the service logic, and

at least one of the services is accessed via a standardised network application programming interface.

12. Method according to claim 11, whrein a broker cooperates with, or has access to, the standardised network application programming interface and the services.

13. Method according to claim 11 or 12, wherein the standardised network application programming interface is provided in the network(s), or between service providing elements and the network(s).

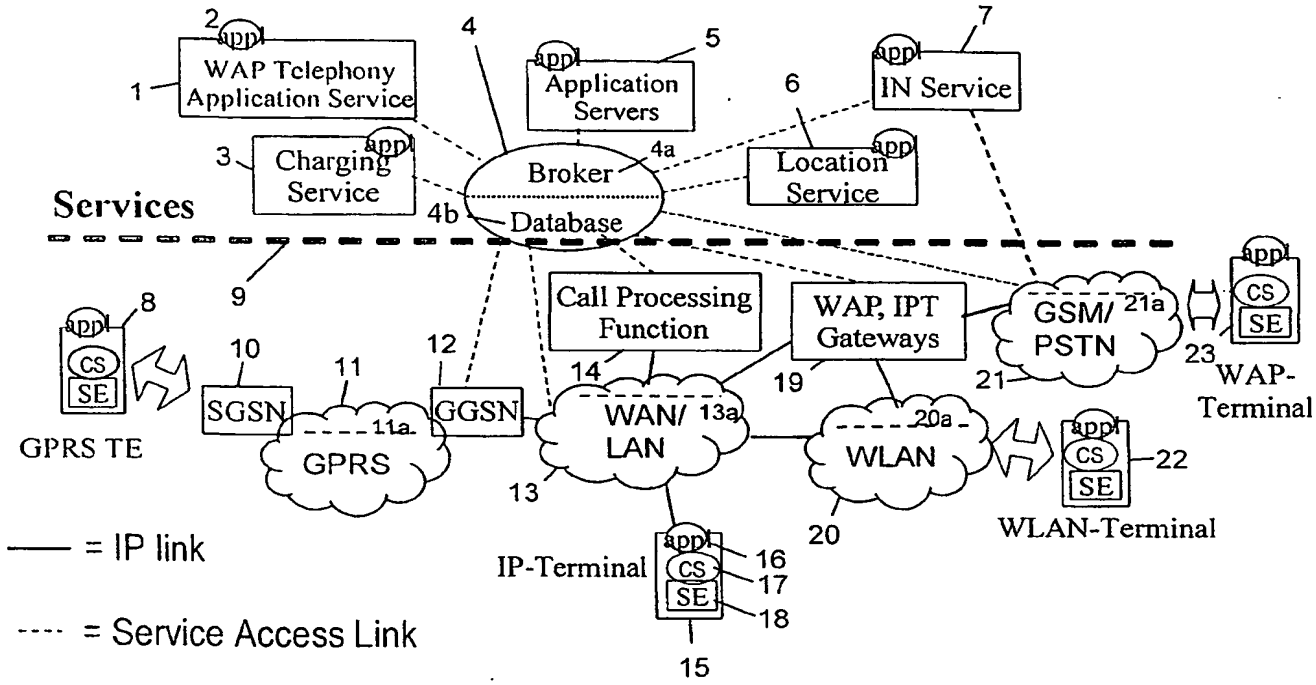
14. Method according to any one of claims 11 to 13, wherein at least one of the terminal network elements is a mobile network element, and/or wherein at least one of the terminal network elements is an IP terminal, a WAP terminal and/or a WLAN terminal.

15. Method according to any one of claims 11 to 14, wherein the standardised terminal environment is a MExE or similar environment.

16. Method according to any one of claims 11 to 15, wherein the network(s) is/are a packet-based network.

17. Method according to any one of claims 11 to 16, wherein the network(s) is/are a GPRS, UMTS, WAN, LAN, WLAN, GSM, WCDMA, and/or TDMA network.

18. Method according to any one of claims 11 to 17, wherein the at least one service is a charging service, a location service, an IN (Intelligent Network) service, and/or a WAP telephony application service.


WAP Telephony Application Service
Application Servers
IN Service
Charging Service
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Location Service
Database
Services
Call Processing Function
WAP, IPT Gateways
GSM/ PSTN
WAP-Terminal
GPRS TE
SGSN
GGSN
GPRS
WAN/ LAN
WLAN
WLAN-Terminal
IP-Terminal
= IP link
= Service Access Link

Fig. 1

INTERNATIONAL SEARCH REPORT

Int al Application No
PCT/EP 00/08009

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00 42760 A (ERICSSON TELEFON AB L M) 20 July 2000 (2000-07-20) abstract page 4, line 14 -page 5, line 2 page 5, line 24 -page 6, line 4 page 8, line 6 -page 9, line 15 page 12, line 19 - line 22 page 38, line 3 - line 7; claims 16,19	1-6, 8-14, 16-18

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the International search	Date of mailing of the international search report
6 June 2001	13/06/2001

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0042760 A	20-07-2000	AU 2334400 A	01-08-2000
		AU 2334500 A	01-08-2000
		WO 0041499 A	20-07-2000

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